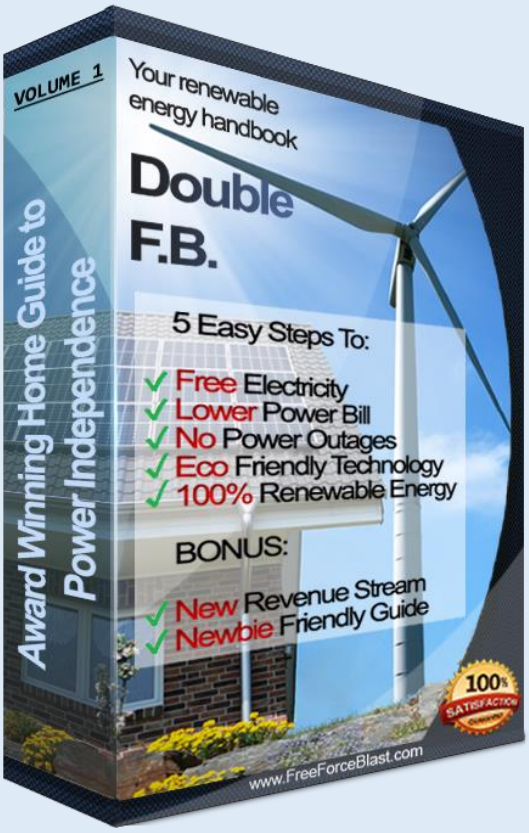
Written by **Robert J. Cox** presents

Energy corporations' cartel killer

Award winning Power Mogul's home guide to

Free Wind-Powered Energy

Double F.B.



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Double F.B. - Home Guide to Free Wind-Powered Energy

These days the world relies mostly on fossil fuels to satisfy energy demand — oil, coal and natural gas. These natural resources are being depleted due to human extraction and use. Fossil fuels are not renewable; creation rate is so slow that reserves cannot be restored in our lifetime. Once they are gone, it more or less forever. The world is slowly but steadily dipping into energy crisis. Big energy corporations feel free to raise the prices, as they want. It's your choice – either bend over and pay or start thinking about own energy independence.

Only renewable energy sources can bring such independence. One of these sources is wind. The humanity has been taking advantage of the wind energy since ancient times. Previously, the wind energy served for some auxiliary tasks like water pumping or milling grain. After the industrial revolution, the idea that wind can be used to make electric power has developed. Today thousands people from all over the globe take advantage of the green environment-friendly energy, provided by wind.

However, the wind energy has one distinct downside. The system in a whole and its installation can be very expensive. Moreover, unfortunately, there is no clear premise for alternative power solutions to get cheaper in the nearest future. The main reason why the situation is staying this way is power cartel unwillingness to lose money. They will keep their profits at any cost! These guys will never let alternative power sources spread massively. That is why people are sometimes afraid of all renewable energy solutions. Because, price is what really matters!

This book was written in attempt to favor mass spreading of renewable energy. It is aimed at people being tired of sky-high energy prices, at the same time willing to do something good for the environment. This eBook will show how to build your own wind turbine from scratch and start using your own electricity from the power, the nature kindly offers us. This guide will ensure that you take advantage of renewable energy solution and save your money in the process.

Wind-powered turbine basics

There are many wind powered electric generation devices available on market today, with a vast variety of designs, sizes and complexities. In this **Volume 1 eBook** we will cover a simple home-build design that will be able to output enough energy for you to power many home devices such as, Audio/Video sets, phones, lighting systems, computers, as well as home appliances such as mixers and blenders. When going through different designs of this **free energy generator,** no matter of their complexities, they all have same basics:

Electric generator

Energy production device, a generator that is transforming kinetic energy into electric energy

Wind blades

Basically a propeller, which is attached to generator's shaft, being rotated by wind that in turn produces electric energy

Turbine mounting

Provides support for generator and blades, and is functioning as "auto" spinning mechanism, to keep blades facing wind flow direction

Wind tower

Serving as supporting structure for mount, generator and blades

Electronic control system and Batteries

Electric current stabilizer serves to soften the spikes outputs produced by wind turbine, and converts power into friendly form for "home" appliances, while storing excess energy into power-supply storage unit, for steady and controlled flow of electric current for later use

By splitting our project onto five "independent" systems, you now probably realize that this is not a very complex device. In fact, production of this wind turbine is very much straight forward, and it should not pose any difficulties to anyone with basic technical skills. In addition, even if you lack basic electronic knowledge, you can easily ask your local electronic technician to build this simple inexpensive controlling circuitry for you.

Electric generator

Basics

When building a wind turbine, many people decide to build their own generators. Depending on your technical expertise level, this may also be an option. However, for sheer complexity of this process, you can start with simpler alternative: the usage of existent generators. There are many generators available on market today. The selection of generator should depend on the power volume you require, or wish to achieve.

In this **Volume 1 eBook** we will take an inexpensive generator produced by Ametek, found in many old devices. Ametek developed and assembled numerous types of generators, and one of best generators for this task is Ametek's 200 Watt Permanent Magnet Alternator, that works very well with this **Wind Power System**. However, there are many PMA DC motors developed by numerous companies. This means that there are also many various possibilities when choosing the one that will suit you most. Permanent magnet alternator DC motors are not designed to work as power producing generators. Thus, they are not the perfect for the job; however, they do serve their purpose well enough, to be considered for wind turbines.

When choosing PMA DC motor to serve as generator, you need to understand few basic rules. By design, these motors require to be driven at much higher speeds than intended, to produce enough power to meet the needed energy output. Knowing this, you can understand now that when selecting a proper motor to serve as a generator, only those motors are viable that have low rpm, high current and high DC voltages. Motors with low voltage or high rpm will not produce enough energy to be of any value to serve as wind turbines.

What you are looking for is a motor that is able to output higher than 12V at reasonably low rpm and useful current level. To put it in perspective for you, a 30V motor with 325-rpm specs will serve you well as a generator and will output over 12V at low rpm. Whereas a motor with 7200-rpm and 24V will only produce enough energy on much higher rotations per minute, to meet required power output, which is far too high for wind turbine. Keep this in mind when shopping for proper hardware.

Design

Knowing the generator basics, you are now ready to begin with preparations. In this **Volume 1 eBook** we will take 30V Ametek motor, which can be bought on eBay for few dollars. Prices vary from brands to models, and you can use appropriate alternatives just as well. If you cannot find Ametek for your price range, you can just as easily purchase any other brand, providing you are shopping with aforementioned information. Now that you already have a generator in your hand, you can test it by mounting 12V light bulb on it and spin the shaft with your fingers. If generator is functioning properly, it will light it up. A generator like this will give you few hundreds of Watts power output, which should suffice for most of your appliances. Next step is mounting blades on it, and give it a spin.

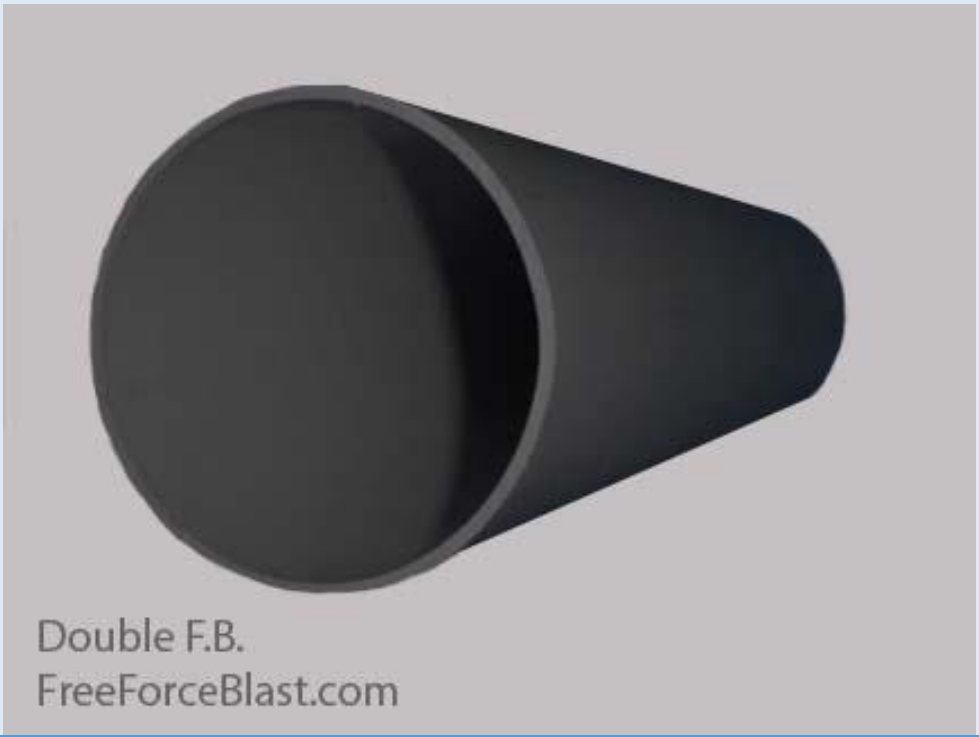
Wind blades

Following the newly acquired generator, you will continue with blades. Blades can be made out of different materials such as wood, metal, or plastic. The choice of material you wish to use is yours, but in this **Volume 1 eBook** we will assume that you have no access to wood carving or metal shaping tools. This leaves us with last option, PVC or ABS pipe. Now, PVC pipes are easily obtainable, cheap, and since plastic is soft material, it can be also easily cut apart and shaped into airfoils.

Creating wind blades

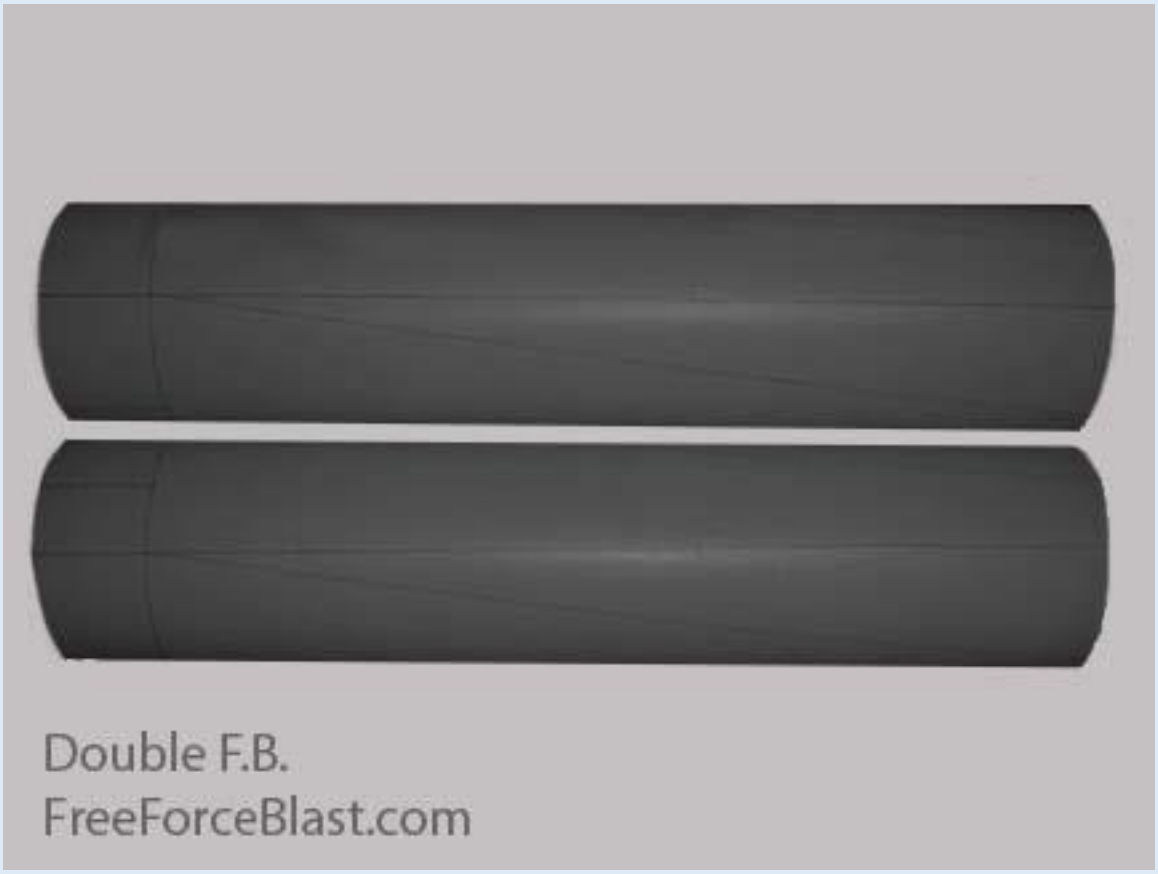
First you need to go through the usual "how big do you need them". Once you have decided the length you need to go and get your PVC pipe. Pipe's length needs to be the same length as the blades. Your pipe should be about 1/5 as thick as it is long. E.g. if you have 50 cm blades, then PVC pipe should have a diameter of 4 inches. One length of PVC pipe can make four blades.

So now that you have your PVC pipe you can continue with shaping it into airfoils. For example, let us assume that you wish to create a set of 20-inch blades. So here you go.



Cutting PVC pipe

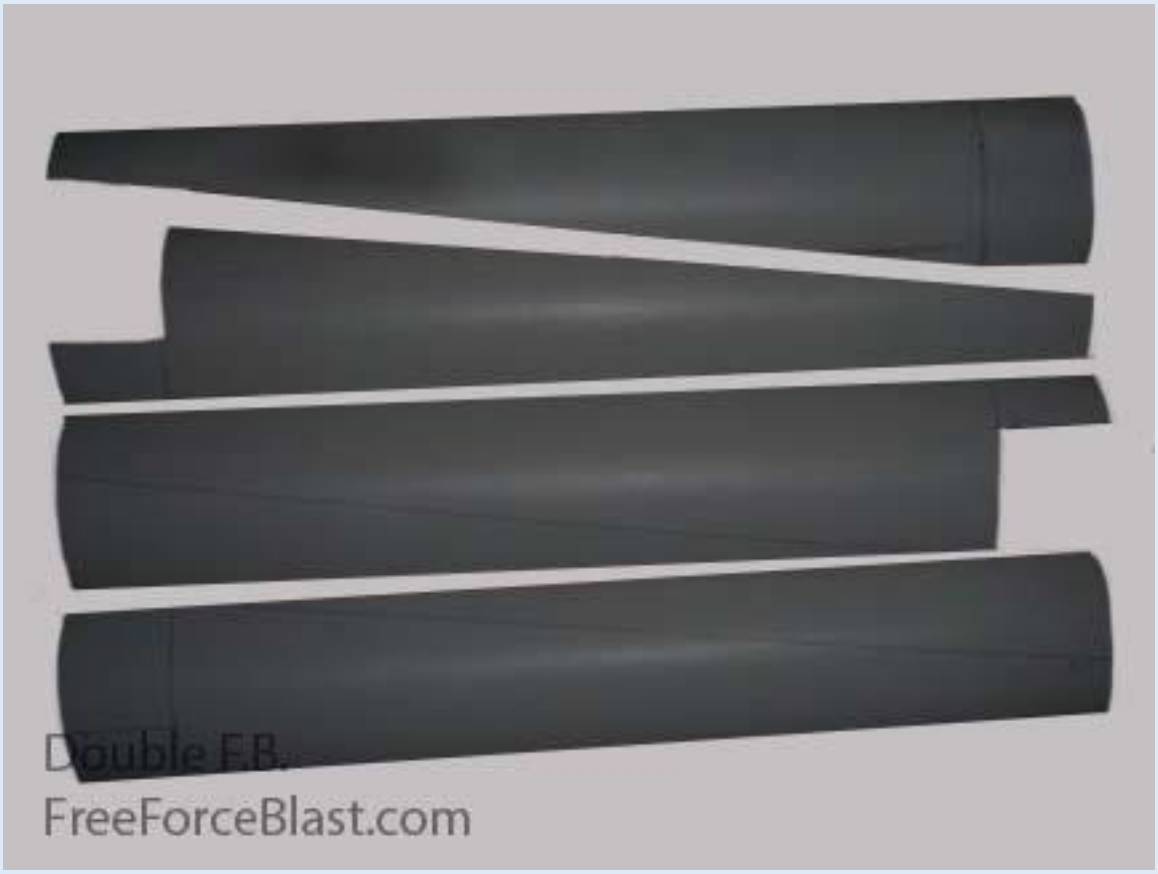
First, you need to quarter the pipe. Now drawing straight line and measuring on round surfaces is hard, so the best method is to get a large sheet of paper. If you wrap the sheet tightly around the pipe, you get a straight line round the pipe. If you line one edge of the paper with this line, you can get straight lines going down the pipe. With the paper wrapped round the pipe, you can mark the circumference. Then you can fold the paper in half and mark half way round the pipe. Then in half again and get quarters of the pipes. Using this simple method, you should be able to draw good straight lines all over the pipe dividing it lengthways into quarters. Now run your saw down the pipe to cut it in half.



Continue with quartering.

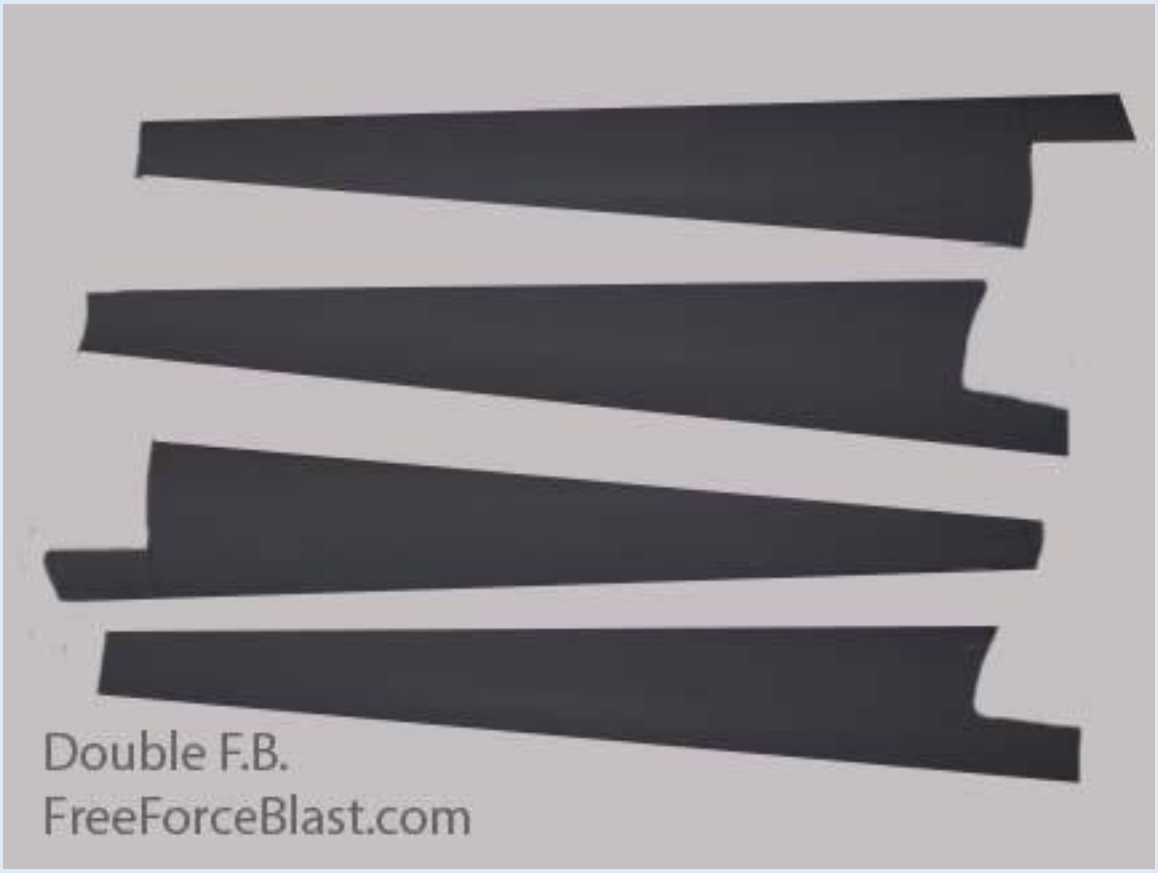
Blade shaping

Now for each of your four quarters you want to do two things
1) Cut out a rectangle from the base about 2-inches in, so you can easily attach it to whatever you want to. Before you do the cut, drill a hole in the corner to improve the structural integrity of the material. Once the hole is drilled, cut the rectangles out being careful not to cut past the hole.
2) Cut from the high tip of the base to the point.



Wind blade finalization

Now you are all done, with four blades ready to use. In case you were not able to find a proper color to match blades to your ambient, you can paint them, giving them more natural look.

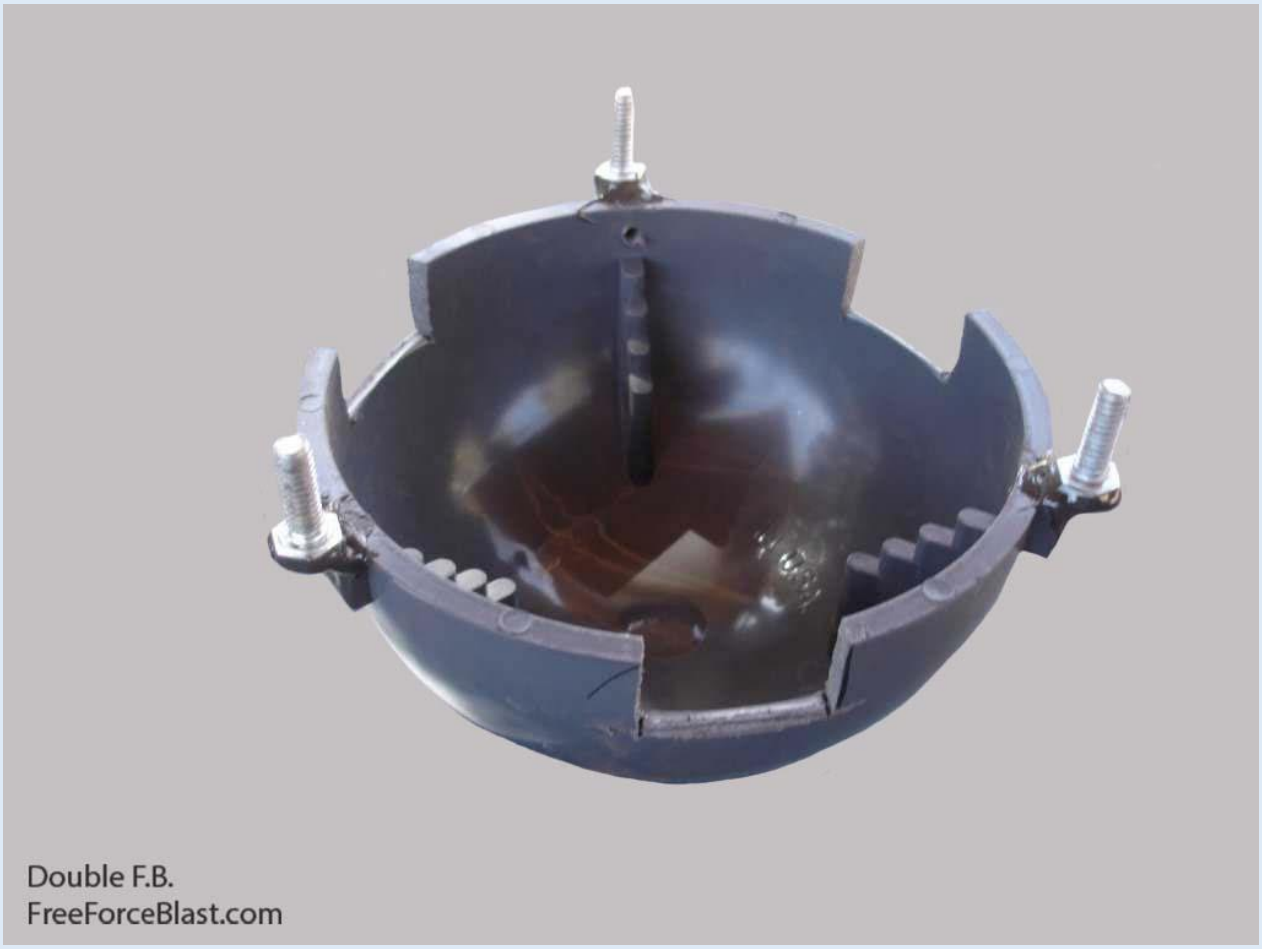


Blade hub

Now, first you need to create a hub, and bolt blades to it. After, you will attach it to the motor's shaft. The final choice of material used for hub is yours, but let us assume you have access to metal disk or toothed pulley, which fits motor's shaft perfectly. If the size is sufficient to mount blades on, you are good to go. Now you have to measure surface of the disk and drill holes, where you will bolt blades after.

After assembly, your piece of hardware should be similar to as seen below, with the blades attached.

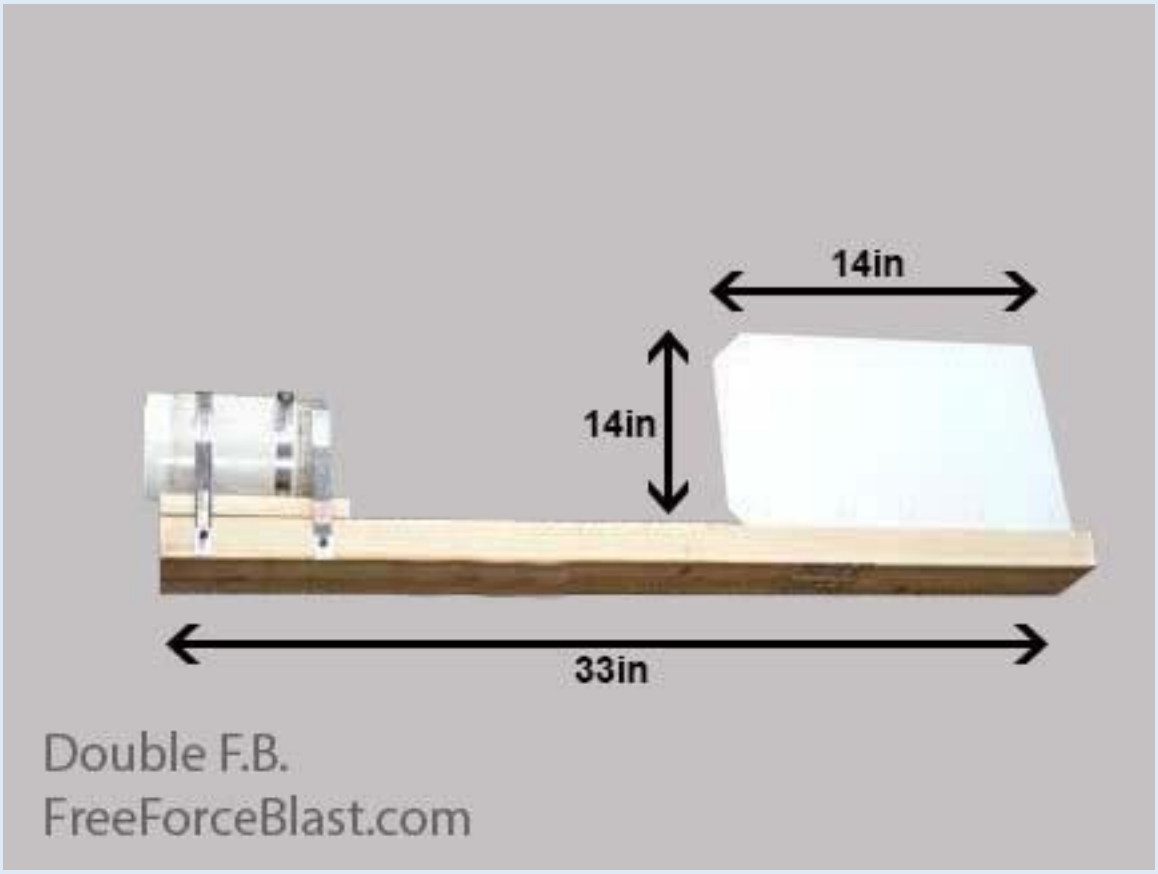
To give your design a more professional look, you can visit your local store and acquire a dome shaped vent cap. Its aerodynamic properties will also help increase efficiency of airflow around hub and blades, making your wind turbine potentially squeezing out more power output in the process.



After you are done with drilling and mounting, your professionally looking homemade design will resemble showcase below.

Turbine mounting

Now that turbine and blade hub are ready, you can begin with mount design. Since you are trying to keep this design simple, you will grab a piece of wood and shape it as necessary. What you are trying to achieve is a placeholder to strap motor on (in front), and tail (in back). These measurements are not critical for optimal performance, but try to keep it at least at 2 x 4 inch size, to fit the motor on, with length of approximately 30-40 inches, would be sufficient. To protect the motor from weather changes and possible mechanical accidents, grab some PVC pipe and create a shielding around it, which you will place over at the end. Now, the tail section requires some counterweight to balance the front side motor weight of your wind mount, and it also serves as turning mechanism, keeping turbine facing wind flow direction at all times. Make sure that tail section is big enough to turn mount the moment wind direction changes. On picture below, you can see marked sizes of working model, to give you a direct visual perspective.

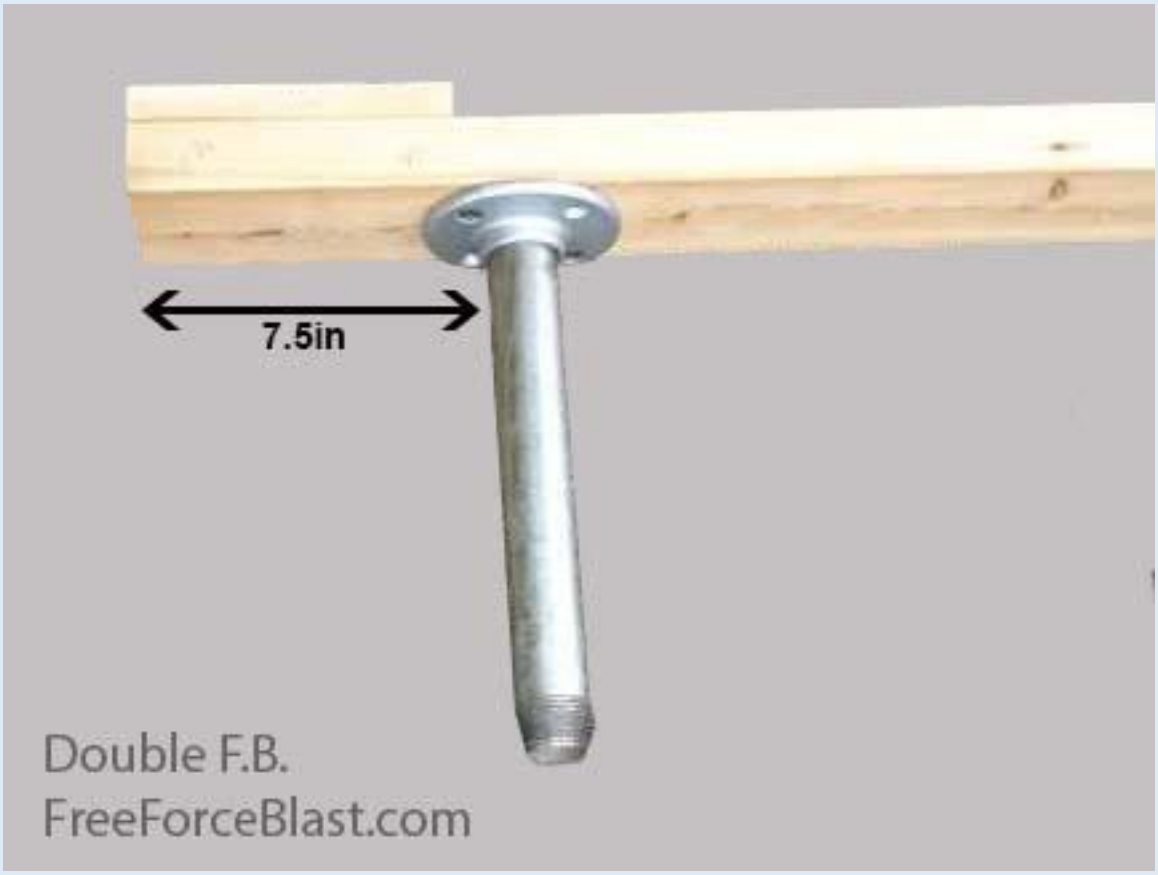


It is time to start thinking ahead, for which you will need to start preparing for wind tower. Next thing on your agenda is to add a bearing to your mount, which will serve as support and spinning mechanism to keep turbine faced to wind flow.

Use one ¼-inch diameter conduit as the turbine tower. Given such diameter, 1-inch iron pipefittings are recommended to ensure proper slip-fit inside the conduit.

Attach a 1-inch iron floor flange centered 7 1/2 inches back from the motor end of the 2X4 and screw a 10-inch long iron pipe nipple into it. The nipple has to slip into the top of the conduit. This will provide the tower with proper bearing.

Drill a hole in the 2X4 down the center of the pipe/conduit unit. This hole will server for wire threading through the conduit.

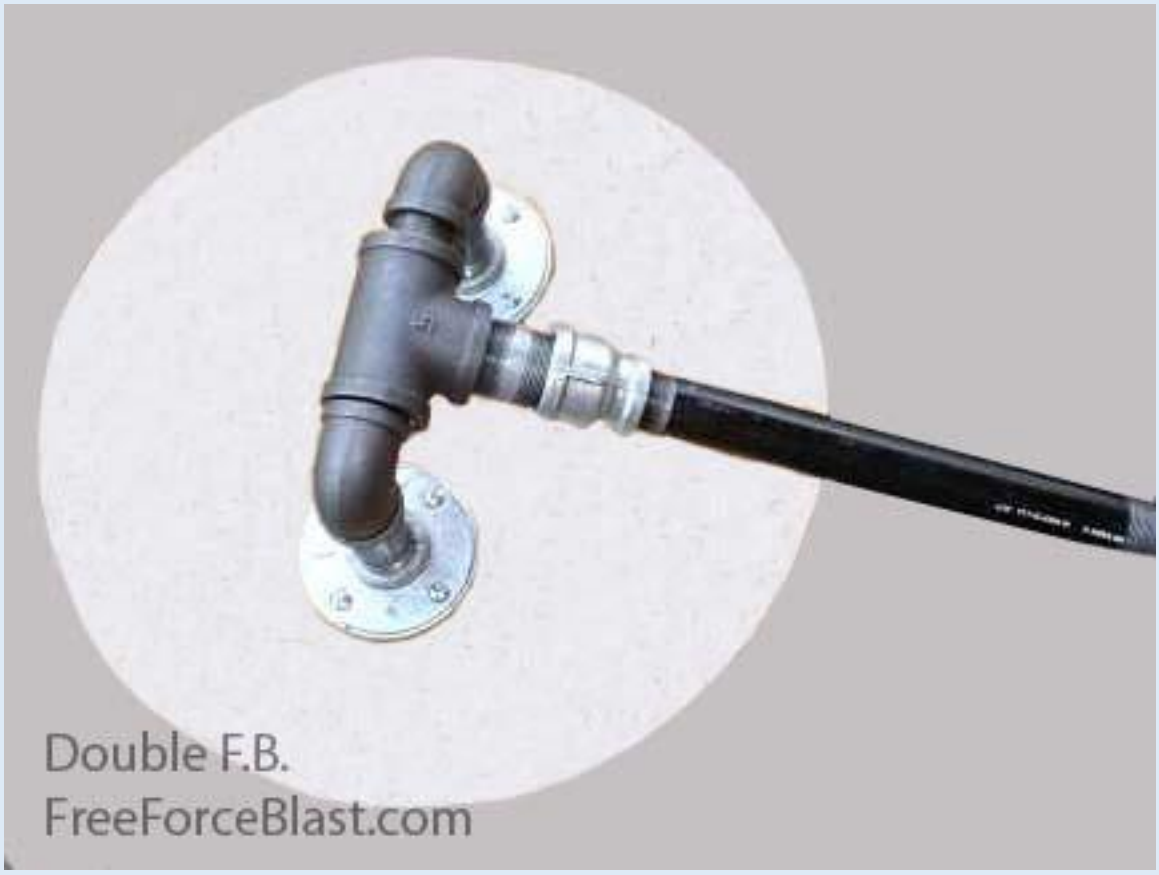


Tower base preparation guide

Cut a 2-foot diameter disk out of plywood. Create a U-shaped assembly out of 1-inch pipefittings. Put a 1 1/4 inch Tee In the middle of that assembly. The Tee turns around the 1-inch pipe and forms a hinge that allows the operator to raise and lower the tower.

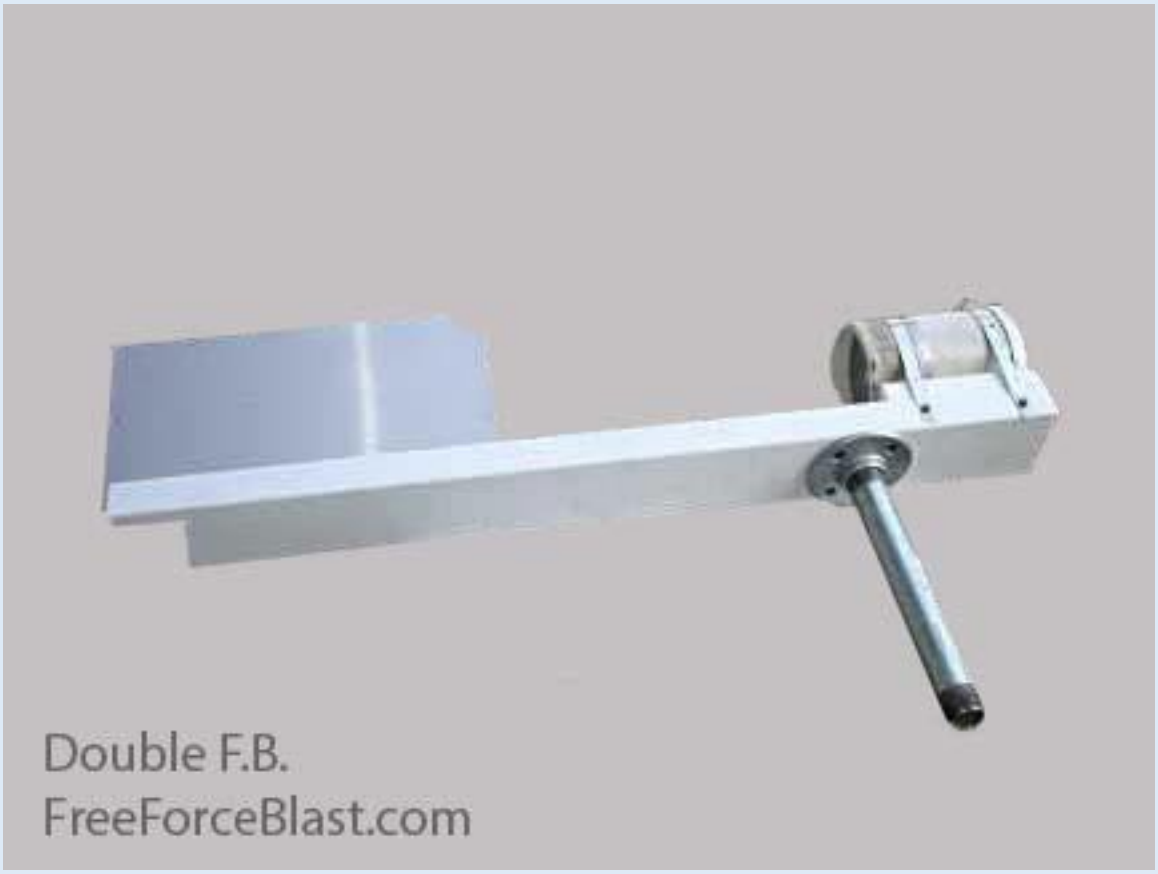
Add a close nipple, a 1 1/4 to 1 reducing fitting, and a 12-inch nipple. Then add a 1-inch Tee between the reducer and the 12-inch nipple to create a place for the wires to exit the pipe.

Drill some holes in the wooden disk to allow using steel stakes to lock it in place on the ground. Refer the picture to make sure your assembly is correct.



The head unit assembly

Paint wooden part with any outdoor-suitable paint to prevent wood from damage due to different weather conditions. Add lead counterweight to the side of the 2x4 under the tail to balance the head. Attach blades to the head unit, as illustrated on the picture.

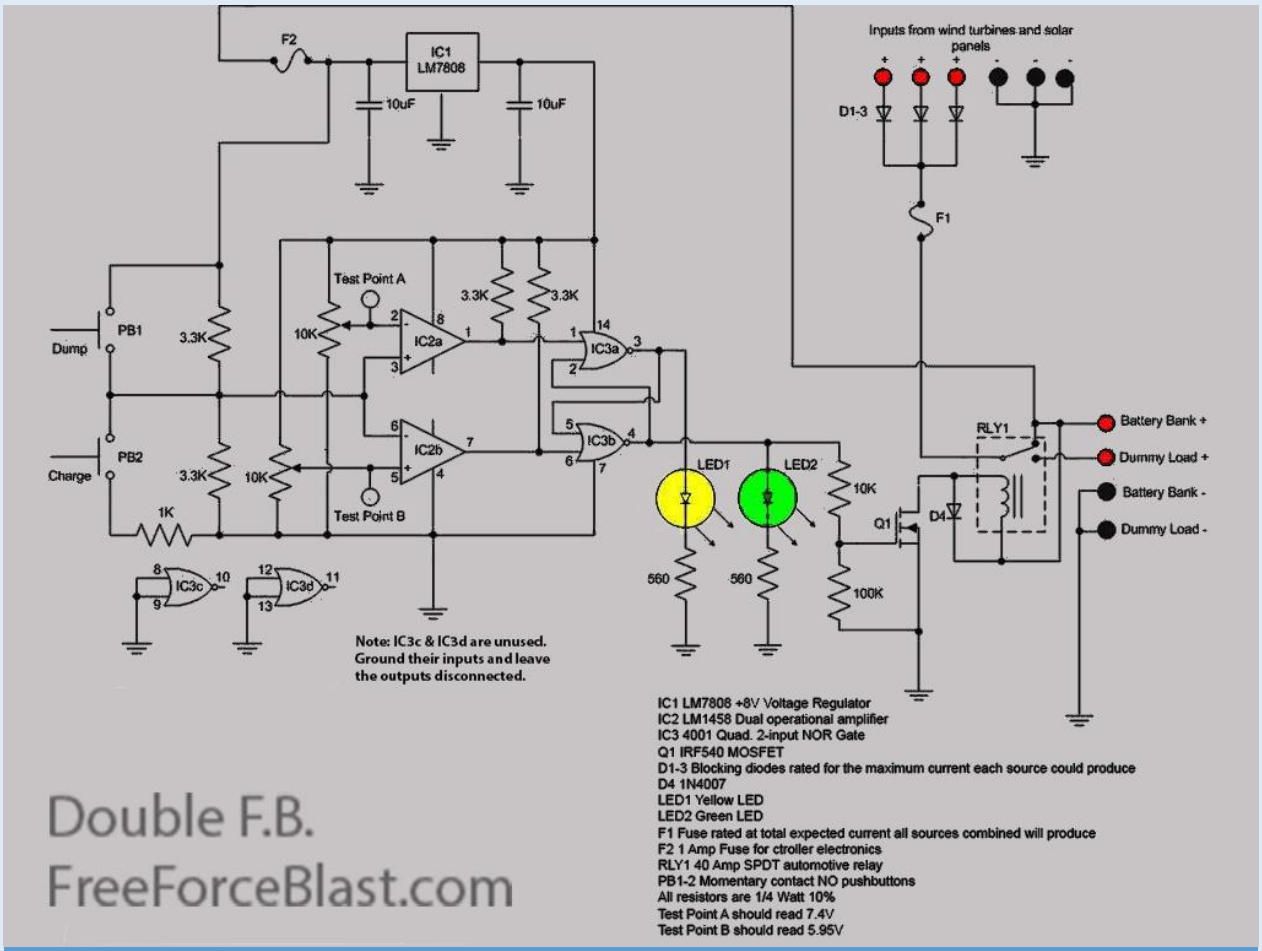


Caution: do not try to test the assembled head unit, holding it in hands. Spinning blades present significant danger for the operator. Make sure, the head unit is mounted before doing any tests.

Electronic control system
Charge controller schematic

Let us assume that you have no access to commercial controller, and prefer to build one yourself. To simplify creation process, you will build your first controller on prototyping board, which will allow you to get right on it, without any external help. In this **Volume 1 eBook**, we will skip PCB design, so you can familiarize yourself with electronics basics. If however, you have the necessary knowledge to create PCB right away, you are welcome to do so.

This is the recommended self-built charge controller schematic. If you have enough electronic knowledge and lacking some parts, you are eligible to substitute elements with their analogs. It is not essential to follow this design precisely. There are no mistakes to use a different operational amplifier or different MOSFET than the original design. The majority of the resistor values are not critical. Do not hesitate to experiment.

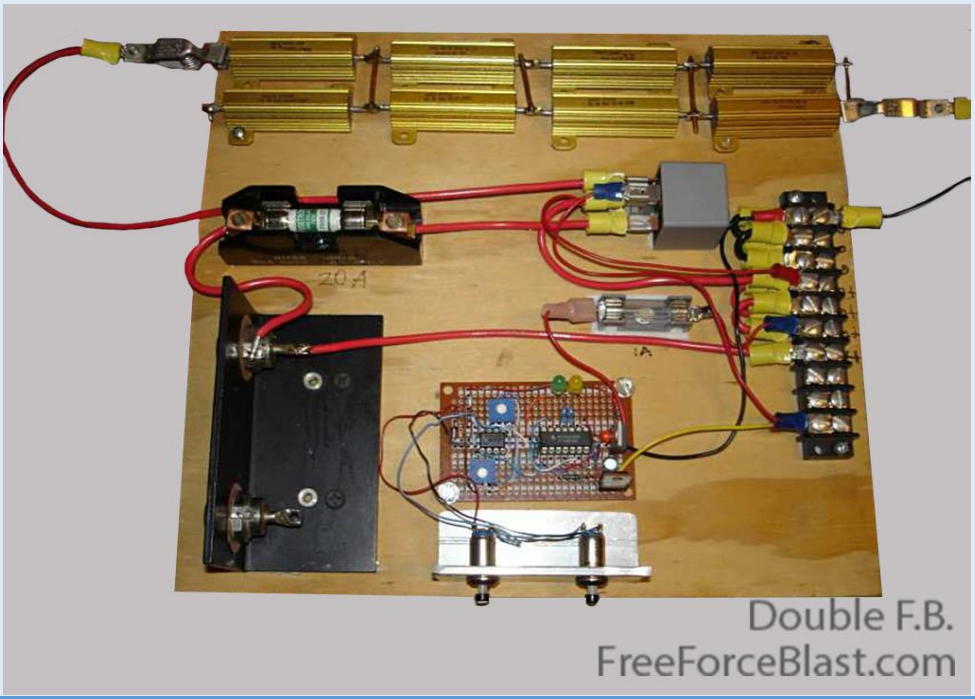


Electronic control system overview

A typical wind power station consists of the wind turbine itself, batteries to store generated power, a blocking diode to prevent power drain to spin the motor, a secondary load to be able to dump power from turbine, even if battery is 100%-charged. One of the most important elements is a charge controller, a device, which runs everything.

There are many kinds of such controllers, designed for solar and wind power stations. Every store, dealing with alternative and sustainable energy will have them in stock. In addition, you can easily find them for sale on eBay. In this book we will give an example, how you can assemble your own controller. If you are an electronic enthusiast, you may need very few components to purchase. However, if not, do not worry: all components are easily available and are not expensive.

No matter whether you build your own controller or buy one from store, the controller is an essential part of the system. The general principal how the controller works is that it monitors the voltage of the battery(s) in the system and either sends power from the generator into the batteries to recharge them, or dumps the power from the wind turbine into a secondary load if the batteries are 100%-charged (that's done to prevent overcharging and damaging batteries).



Assembly guide

Take plywood or other dielectric sheet material as a base for whole setup. Screw every following element with bolts.

Put the little perfboard, carrying integrated circuits and other elements of the charge controller, in the lower center of plywood.

Place silver bracket close to perfboard. The silver bracket is used to hold two buttons that enable to toggle the unit manually between charging batteries and dumping power to a secondary load.

Mount large heat sink, painted in black, aside of the perfboard. Drill two holes in it to install a pair of 40 Amp blocking diodes. The second diode will stay, leaving place for another wind turbine or photovoltaic solar panel.

Attach the double row of high-Wattage resistors at the opposite side to buttons. They are visible as the gold elements on the picture. These resistors serve as a dummy load for the turbine. Make sure, the double row has taps at 2-Ohm intervals. This dummy load is used as a secondary load to dump power from the wind turbine, when the battery is 100%-charged. Additionally, dummy load is used for testing purposes.

Insert the main fuse for the wind turbine aside of the dummy load. Next to it, put the 40 Amp SPDT automotive relay, this works as electronic key sending the turbine power either to the bank of batteries or to the dummy load. It is visible as the grey cube on the picture.

In the end, place the terminal block near another side of plywood to be able to connect everything together.

Charge controller setup

In working state, the wind turbine is connected directly to the controller. Wires then go from the controller to the battery. The load is powered directly from the battery. Once the battery voltage drops below 11.9 volts, the controller makes the turbine charge the battery. Once the battery voltage goes above 14.8 volts, the controller goes in power dumping mode into a dummy load. The circuit also includes some trimmers to adjust the voltage levels when the controller toggles back and forth between charging and dumping modes. Recommended value here is 11.9V for the discharge point and 14.8V for the 100%-charged point. Such tip is based on the research of the industry experts on how to charge lead acid batteries properly.

In the interval of the battery voltage between 11.9V and 14.8V, the whole system can be switched between either charging or dumping. A couple of push buttons provides you with an opportunity to switch between those modes any time for testing purposes. Of course, the system runs on automatic basis. There are a couple of LEDs on the device: the yellow one is lit when battery is charging, the green one is lit when the batter is full. Such behavior can help you to understand what is happening with the device at particular moment. To obtain the precise figures you can use a multimeter to measure battery voltage as well as generator output voltage. It is recommended to add a built-in voltmeter to the charge controller.

Use an adjustable power supply, connected to the grid to set up your charge controller precisely. Set its output voltage at 11.9V and tune one of the trimmers to ensure battery goes to charging mode. Then, set the voltage to 14V and tune the second trimmer to ensure the battery stops charging here. Such battery behavior simulation helps to make everything work as intended.

Caution: connect your batteries first and only then connect the wind turbine.

If you do not follow this step precisely, the following will happen:

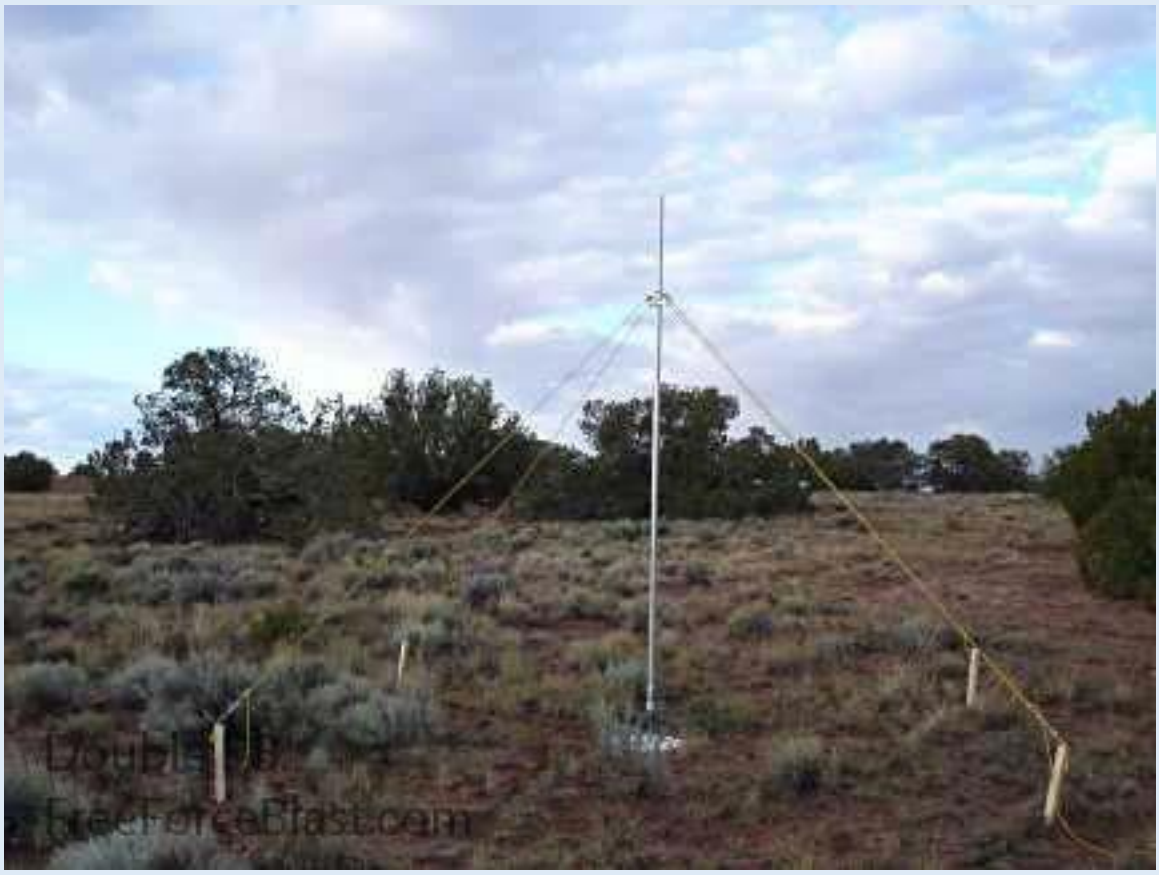
The voltage will swing strongly in the system due to gusts of wind, making the controller behave erratically. Such behavior results in integrated circuits damage and final device malfunction.

Make sure to connect the battery first, and then connect the wind turbine. Also, make sure you did disconnect the wind turbine first when disassembling the system. Disconnect the battery last.

Turbine mounting

After the project is complete, disassemble the turbine and carefully pack the parts and the necessary tools to mount the whole system in a new place. If mounting the wind generator near your home, skip this step.

For proper wind turbine operation, a tower is an integral part.



Tower mounting guide

Purchase a conduit, if you do not have one. The 10 foot long, one ¼-inch conduit is recommended. The conduit is used as a tower and it helps to shorten the assembly process duration. In order to mount a tower, install first four large wooden stakes and drive them in the ground. Then take a nylon rope and anchor the pole to those stakes.

Plumb up the tower, using turnbuckles located on the lower ends of each guy-line. Release the rope from either stake in line with the hinge at the base, in order to raise and drop the tower easily.

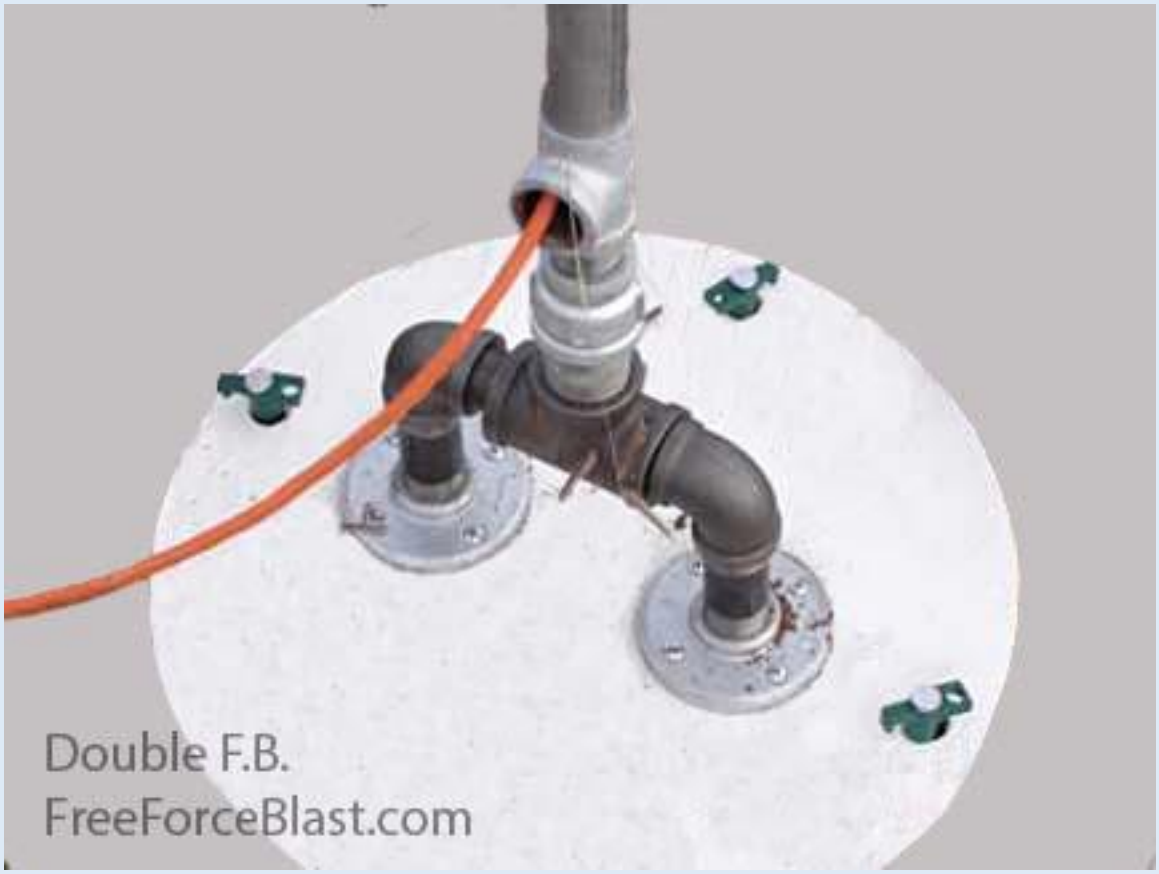
Such arrangement will work fine for testing purposes.

Attach the guy-lines around the top of the tower, as shown on the picture. Use chain link brackets as tying points for guy-lines. Make sure, the diameter of the pole and those brackets are equal, otherwise you will need extra fixation.

Stake the base of the tower to the ground, as shown on the picture. Thread the wire throughout the tower:

If it is cold outside, push the wire through the conduit, as it gets rather stiff.

In warmer weather, use an extra fish tape or thin line to pull the cord through the conduit.



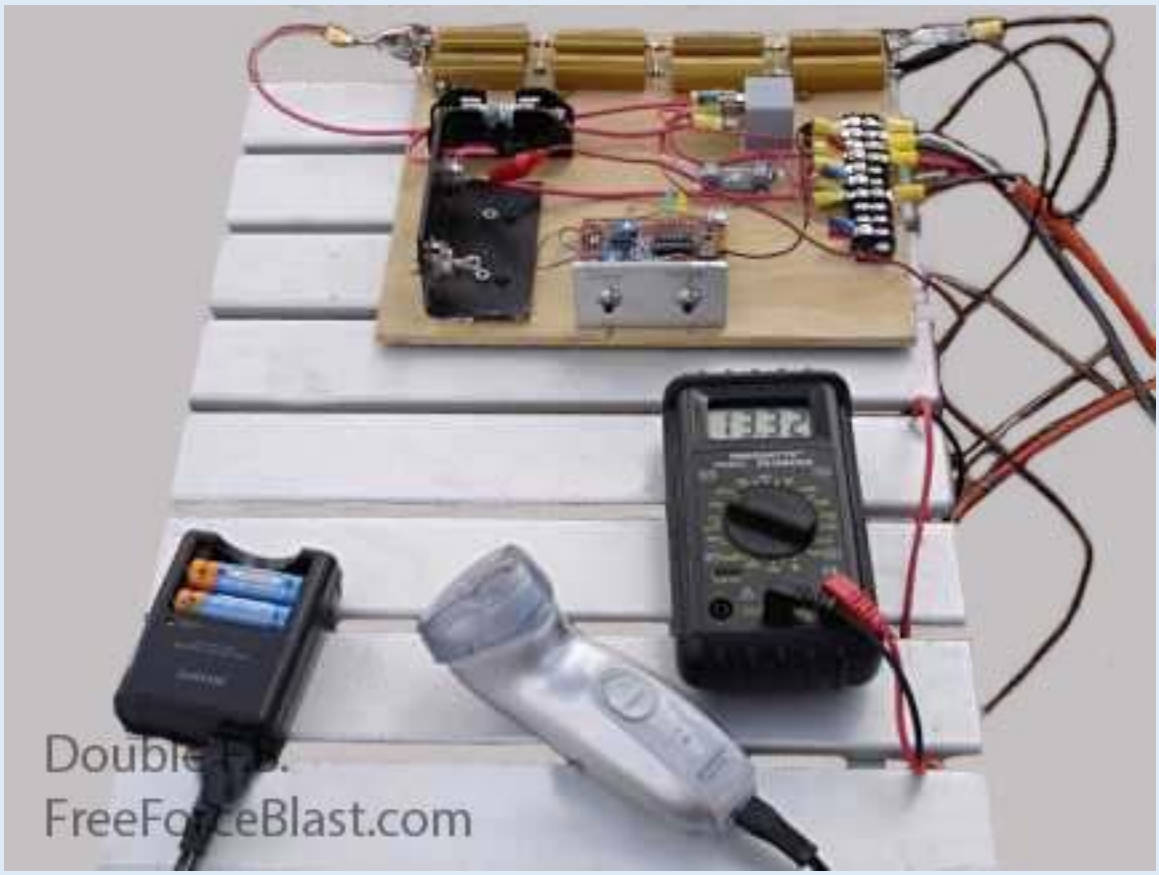
These pictures show the wind turbine mounted on the top of the tower.

The head unit will rotate according to wind direction, making a proper bearing obligatory. To achieve it, grease up the pipe on the bottom of the head unit and slid it into the very top of the conduit.

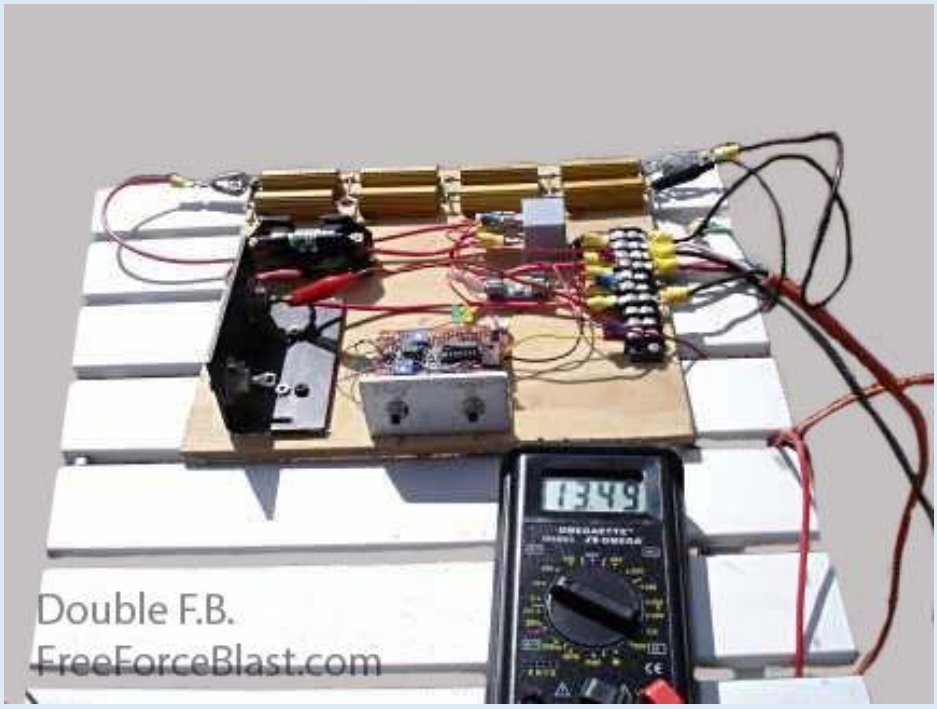
The Electronics

Attach the multimeter to the system to keep track of voltage. Attach the AC inverter used to power up general electric devices, requiring 120V AC such as shaver and AA battery charger, for example.

The wind turbine is producing around 13.3V now, according to multimeter. Load is caused by previously mentioned AA battery charger and electric shaver, connected through the AC inverter.



On this photo, you can see the multimeter showing almost 13.5V. The wind velocity increases, hence, the voltage goes up as well. After the wind starts blowing, the generator head snaps around into the wind flow and begins to spin up. The spin up process is rather quick until the output voltage reaches and exceeds the battery voltage plus blocking diode voltage drop. The number is about 13.2V, it all depends on how much the battery is charged at particular moment. While this voltage is not reached, the turbine runs without any load. However, once this voltage is exceeded, the load suddenly takes place, making the turbine store power into the battery. While the turbine is under load, it is not susceptible to quick spin up: only insignificant RPM increase is noticed as wind starts blowing faster. The higher wind velocity leads to larger amount of power, sent to the battery. This means higher load on the turbine. The conclusion is simple: the system is self-sustainable.



Take additional measures to prevent the generator from damage, especially when experiencing storm winds. Switch the charge controller into dummy load mode to let all the power generated by the turbine be dissipated on the resistors. This serves as a good brake for the turbine to slow down. Alternatively, short the output. Shorting the output even works a better brake. No matter how strong the gusts are, it makes the turbine halt almost immediately. For security reasons, always do shorting while dealing with turbine mounting and demounting. This serves to prevent the operator from danger of being cut by its blades.

Final steps

To eliminate the possibility of a sudden short curcuit, while all electronic parts are laid on the aliminum table, take some security measures and make things looking neat: take a piece of plywood or similar dielectric sheet material and set all the electronics there. Also, arrange all the wiring. Lay an extension cord (visible as the orange cord on the photo) to power your stuff.

Price table

The following table projects price figures. Please note that final numbers may differ slightly depending on your location and other circumstances.

Part	Origin	Price
Motor/Generator	eBay	$25
Battery	eBay	$15
AC Inverter	eBay	$2
Misc. pipe fittings	Local store	$42
Pipe for blades	Local store	$13
Misc. hardware	Local store	$8
Conduit	Local store	$20
Wood & Aluminum	Local store	$2
Power Cable	Local store	$1
Rope & Turnbuckles	Local store	$19
Electronic Parts	Local store	$20
Relay	Local store	$14
Spray paint	Local store	$1
Total		**182**

Final thoughts

Now you can watch movies, browse the internet (in case of existing connectivity), do your scientific work or whatever without any risks of running out of power anytime soon. There will be no "out of power" problems, at least while the wind is blowing and the turbine is spinning. Besides the laptop, you can freely use the turbine power to charge AA batteries, digital cameras, mobile phones or use it to light the lamps or LEDs. Any device with moderate wattage requirements should work.

Congratulations. You just did a remarkable job. This **Volume 1 eBook** covers basic inexpensive design, for you to begin your "dreams" and learn of self-sustaining ways.

As these words are being written, our **Volume 2 eBook**, is already in the process of making, where we will be covering an upgraded version of current system.

In not-so-distant future, we will embark on an extraordinary journey of industry-level designs, marked **Volume 3 eBook**. In it, you will learn how to become a true entrepreneur power supplier, how to design an excess of wind energy turbines, power up your friends, neighbors or even sell your excess product back to power suppliers. **From this day on, only sky is the limit.**